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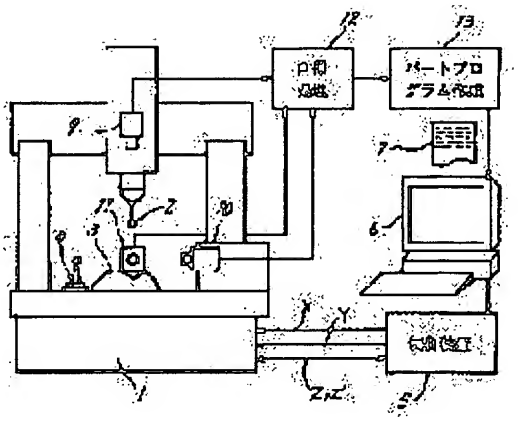
(54) CONTROL SYSTEM FOR THREE-DIMENSIONAL MEASURING DEVICE

(57)Abstract:

PURPOSE: To provide the control system of a three-dimensional measuring device which enables the complete automation of a measuring work also for a measured object having no CAD data.

CONSTITUTION: This system is the control system of a three-dimensional measuring device which is provided with a three-dimensional measuring device 1 provided with a gauge head 2 to move after the surface of a measured object 3 and a computer for control 6 to perform the numerical control of the measuring route of the gauge head 2. A CCD camera 9 to photograph the measured object 3 is arranged on the three-dimensional measuring device 1, the contour shape of the measured object 3 is recognized by performing the image processing for the output signal of the CCD camera 9, the measuring route of the gauge head 2 is generated based on the recognition result and a teaching is performed for the computer for control 6.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] In the 3-dimensional measuring device characterized by providing the following on a 3-dimensional measurement machine (1) Arrange the CCD camera (9) which should photo a measurement object (3), perform an image processing to the output signal of this CCD camera (9), recognize the profile configuration of a measurement object (3), and the measurement path of a gauge head (2) is generated based on this recognition result. The control system of the 3-dimensional measuring device characterized by carrying out teaching to the computer for control (6) The 3-dimensional measurement machine equipped with the gauge head (2) which should imitate and should move in the front face of a measurement object (3) (1) The computer for control which should carry out numerical control of the measurement path of a gauge head (2) (6)

[Translation done.]

* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the control system of a 3-dimensional contact process measuring device.
[0002]
[Description of the Prior Art] Surveying the curved-surface configuration of the 3-dimensional body which the 3-dimensional measuring device of the contact process which surveys the sculptured-surface configuration of a 3-dimensional body (digitization) is conventionally known, for example, was produced based on three-dimensional-CAD data, and comparing CAD data with survey data is performed (the magazine "Nikkei mechanical" December 23, 1991 issue, 28-38 pages).
[0003] Drawing 4 shows the conventional 3-dimensional measuring device. While a 3-dimensional measurement machine (1) is equipped with the gauge head (2) which should imitate and should move in the front face of a measurement object (3) and the measurement path of this gauge head (2) is controlled by the control unit (5), a gauge head (2) imitates and the measurement data accompanying movement is incorporated by the control unit (5).
[0004] The computer for control (6) is connected to a control unit (5), and the measurement path data created by this computer for control (6) are supplied to a control unit (5).
[0005] Furthermore, the part program listing device (14) for creating the instruction group for directing the measurement path and measurement procedure of a gauge head (2) based on three-dimensional-CAD data (8), i.e., a part program, (7), and carrying out teaching to the computer for control (6) is connected to the computer for control (6).
[0006] According to the above-mentioned 3-dimensional measuring device, while the moving trucking of the gauge head on two-dimensional [this] (2) is determined among three-dimensional-CAD data (8) based on the two-dimensional data X and Y, based on the 1-dimensional remaining data Z, interference with the measurement object of a gauge head (2) will be checked, and the measurement path for obtaining survey data Z' about this 1-dimensional direction will be generated.
[0007]
[Problem(s) to be Solved by the Invention] However, the above-mentioned 3-dimensional measuring device smell has indispensable CAD data because of automatic generation of a measurement path, and had the problem as which a measurement operator has to determine a measurement path with manual operation to the measurement object without CAD data. Moreover, to the measurement object with CAD data, the position of the measurement object (3) on a 3-dimensional measurement machine (1) needed to be inputted with manual operation to the computer for control (6), and it had not resulted in full automation of measurement.
[0008] The purpose of this invention is offering the control system of the 3-dimensional measuring device which can automate measurement fully also to a measurement object without CAD data.
[0009]
[Means for Solving the Problem] On the 3-dimensional measurement machine (1) equipped with the gauge head (2), the control system of the 3-dimensional measurement measurement concerning this invention arranges the CCD camera (9) which should photo a measurement object (3), performs an image processing to the output signal of this CCD camera (9), recognizes the profile configuration of a measurement object (3), generates the measurement path of a gauge head (2) based on this recognition result, and it carries out teaching to the computer for control (6).
[0010]
[Function] When a vertical gauge head (2) imitates to the two-dimensional flat surface (X-Y flat surface) which should carry out scanning movement and a gauge head (2) surveys the perpendicular direction (Z direction) of the sculptured

surface of a measurement object (3) by movement, a measurement object (3) is installed in the X-Y flat surface on a 3-dimensional measurement machine (1), and photos this measurement object (3) from Z shaft orientations by the CCD camera (9). The profile configuration on the position (X-Y coordinate) of this measurement object (3) and a X-Y flat surface can be recognized by performing a well-known image processing to the video signal outputted from a CCD camera (9) by this.

[0011] Then, based on this recognition result, the measurement path of the gauge head (2) in a X-Y flat surface is generated. Based on the aforementioned shape-recognition result (profile configuration Q), the starting point S and the terminal point E of Y shaft orientations are determined as X shaft orientations in each measurement cross section which set the interval by constant pitch p so that it may be shown in this case, for example, drawing 3 , and the measurement path of a gauge head (2) is generated.

[0012] Then, a gauge head (2) imitates in the process which a gauge head (2) moves from the starting point S to a terminal point E in each measurement cross section, and the position of Z shaft orientations accompanying movement is surveyed by fixed sampling-period t. Consequently, the X-Y coordinate data of each surveying point of a gauge head (2) and the survey data of Z shaft orientations will be obtained.

[0013]

[Effect of the Invention] According to the control system of the 3-dimensional measuring device concerning this invention, since the image recognition of the position and profile configuration of a measurement object 3-dimensional measurement on a plane is carried out and the measurement path of a gauge head is automatically generated also to a measurement object without CAD data, full automation of measurement is attained.

[0014]

[Example] Hereafter, along with the drawing per example of this invention, it explains in full detail. As shown in drawing 1 , on the 3-dimensional measurement machine (1), three sets (9) of the CCD cameras for photoing a measurement object (3) from 3 shaft orientations, (10), and (11) are installed, and the output of these cameras is supplied to an image processing system (12). In addition, on the 3-dimensional measurement machine (1), the coordinate criteria object (4) used as coordinate criteria is installed, and a photograph is taken by the three above-mentioned sets (9) of CCD cameras, (10), and (11) in the same screen as a measurement object (3).

[0015] An image processing system (12) performs a well-known image processing to each camera output, and recognizes the profile configuration on the 3rd page view of a measurement object (3).

[0016] Thus, the profile configuration on the recognized 3rd page view is supplied to a part program listing device (13) as two-dimensional configuration data, respectively. A part program listing device (13) creates a part program (7) based on the above-mentioned two-dimensional configuration data.

[0017] The created part program (7) is supplied to the computer for control (6), and the teaching of the measurement path of a gauge head (2) is performed.

[0018] Consequently, the control unit (5) of a 3-dimensional measurement machine (1) performs control action by the instructions from the computer for control (6), and measurement of the 3-dimensional configuration of the measurement object (3) by the 3-dimensional measurement machine (1) is performed.

[0019] Drawing 2 expresses a series of processings for part program creation. After installing a measurement object in a 3-dimensional measurement on a plane, a measurement object is photoed by three sets of CCD cameras (S1), and the image processing for a profile shape recognition is performed to the video signal obtained by this (S2).

[0020] Next, the profile configuration recognized by the image processing is expressed to two-dimensional configuration data (S3), and based on these two-dimensional configuration data, a part program is created continuously (S4).

[0021] Drawing 3 expresses the concrete procedure for creating a part program based on the two-dimensional configuration data showing the profile configuration S of a measurement object (3). in addition, the gauge head on the measurement cross section C and its pitch p, and a measurement cross section -- imitating -- Direction D -- and it imitates and data sampling-period t under movement is specified beforehand

[0022] First, based on the output signal of three sets of CCD cameras, the profile configuration on the 3rd page view of a measurement object (3) is recognized. Under the present circumstances, let the position of the aforementioned coordinate criteria object be the origin of coordinates O of an image recognition. And while computing the profile configuration S on a X-Y flat surface, and an intersection with two or more measurement cross sections C, the measurement starting point S and the measurement terminal point E in each measurement cross section are determined by [which imitate and takes Direction D into consideration] being specified beforehand. Furthermore, the point of measurement T by the gauge head is determined by taking into consideration sampling-period t specified beforehand.

[0023] Next, the moving trucking of the gauge head which results from the measurement terminal point E in one measurement cross section to the measurement starting point S in the following measurement cross section is

determined, performing the physical interference check of a gauge head and a measurement object based on two profile configurations photoed to X shaft orientations and Y shaft orientations.
[0024] Performing the above-mentioned procedure, it creates the command for moving a gauge head, and constructs these commands, and a part program listing device (13) completes the part program (7) of a ****** series.
[0025] According to the above-mentioned 3-dimensional measuring device, since a part program is automatically created also to the measurement object which is recognized by the image processing and does not have CAD data, full automation of measurement is possible for the installation position of a measurement object 3-dimensional measurement on a plane.
[0026] Explanation of the above-mentioned example is for explaining this invention, and you should not understand it so that invention of a publication may be limited to a claim or the range may be ****(ed). Moreover, each part composition of this invention of deformation various by technical within the limits given not only in the above-mentioned example but a claim being possible is natural.

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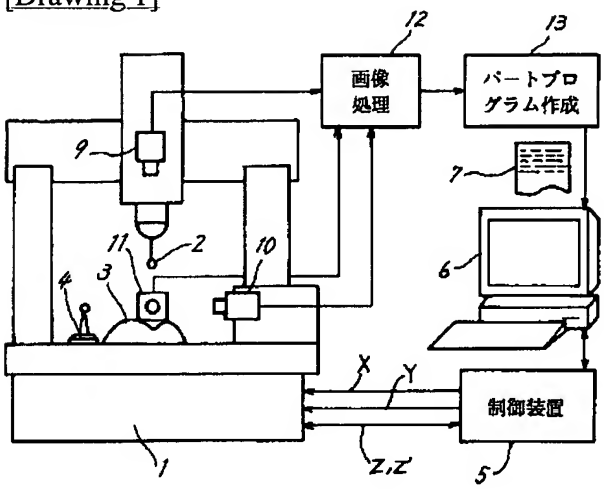
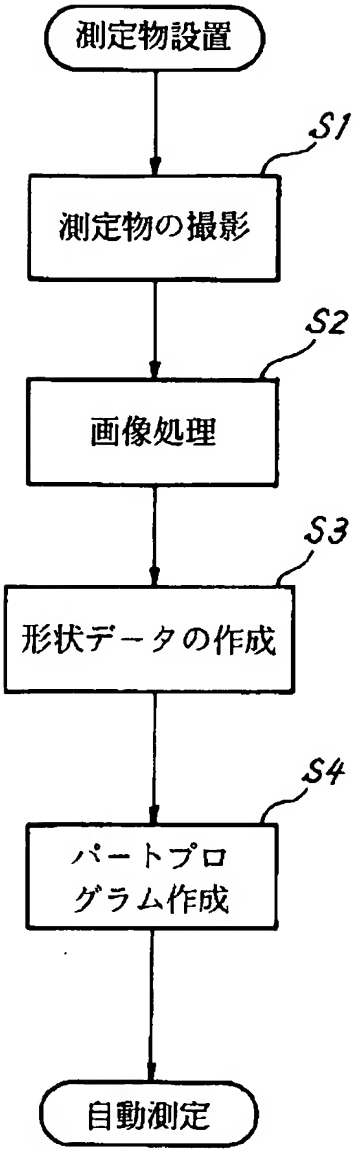
DRAWINGS

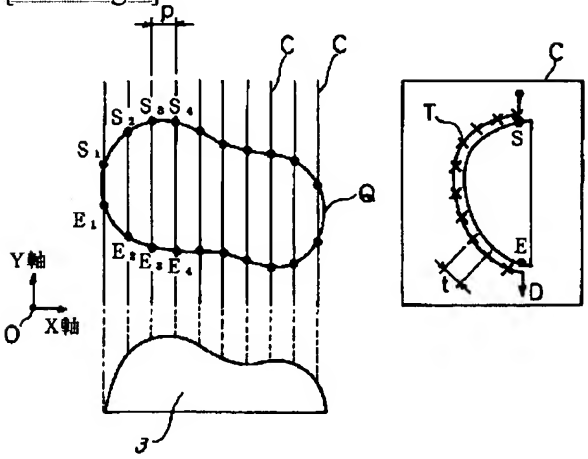
[Drawing 1]



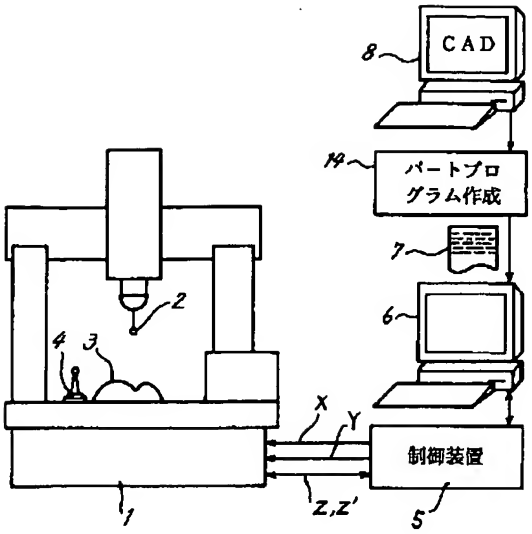
[Drawing 2]



[Drawing 3]



[Drawing 4]



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